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Medical Students' Views on the Role of Artificial Intelligence in Health Care

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Abstract: **Purpose:** This study investigates the perceptions of medical students at Northern Border University (NBU) regarding the role of Artificial Intelligence (AI) in healthcare. **Methods:** A cross-sectional survey was conducted among NBU medical students between June 2024 and March 2025, using a structured questionnaire. A random sampling method was used to recruit 425 participants. A sample of 425 students was selected based on a calculated minimum of 386 participants, ensuring representation with a 95% confidence level and 5% margin of error. Data were analysed using STATA/SE 11.2 with descriptive and inferential statistics. **Results:** Most students acknowledged the beneficial role of AI in enhancing healthcare information access (80.71%), reducing clinical errors (59.06%), and improving decision-making (56.24%). The overall mean perception score was 5.78 (SD ±2.95) out of 10. However, concerns were noted regarding AI's impact on the patient-doctor relationship and confidentiality. No statistically significant differences in perception were found based on age ($p = 0.28$), gender ($p = 0.07$), or academic year ($p = 0.06$). **Conclusion:** NBU medical students largely recognize the potential of AI in healthcare but express reservations about its ethical and interpersonal implications. These insights can guide curriculum enhancements to better integrate AI in medical education.

Key Words Artificial Intelligence; Health care; Medical students; Perceptions; Saudi Arabia

INTRODUCTION

Artificial intelligence (AI) involves replicating human thought processes with machines, often using advanced computer systems [1-2]. Over the last ten years, AI has transformed from a niche research subject into a vital force for innovation in health care, covering machine learning, deep learning, natural language processing, and computer vision. These tools facilitate automated pattern recognition, predictive analytics, and decision support in clinical settings. Its prominence is rapidly growing, with vast potential applications across diverse sectors such as healthcare and education [3-4]. Within the medical realm, numerous studies underscore AI's efficacy in diagnostic radiology, pathology, ophthalmology, dermatology, and beyond [5-7]. AI-driven clinical decision support systems for sepsis prediction and antibiotic stewardship have shortened time-to-treatment and improved adherence to care guidelines [8], while natural language processing applications streamline documentation, coding, and billing, yielding time savings of approximately 30% for resident physicians [9].

Existing literature reveals a prevailing acknowledgment among medical students worldwide regarding the significance of AI in healthcare. Many are optimistic about its integration into their educational curricula, recognizing its potential to enhance medical practices [10-23].

Critical gaps in the literature include a paucity of longitudinal studies that assess how AI education influences clinical performance, diagnostic reasoning, and patient outcomes over time. Region-specific investigations are also lacking, particularly in the Middle East and Saudi Arabia, where cultural attitudes and health system structures may shape perceptions uniquely [24-32]. In Saudi Arabia, sociocultural factors such as high regard for humanistic values in medicine and cautious adoption of disruptive technologies may influence AI perceptions differently than in Western contexts.

By exploring the perceptions of medical students at Northern Border University, this study aims to contribute to the growing body of knowledge on the role of AI in healthcare from the perspective of future healthcare professionals. This study is loosely guided by the Technology Acceptance Model (TAM), which explains how users adopt new technologies based on perceived usefulness and ease of use. Insights gained will inform strategies to facilitate the effective integration of AI technologies into medical education and practice, ultimately enhancing healthcare delivery and patient outcomes.

Therefore, in the current study we aim to investigate the perspectives of Northern Border University medical students concerning AI's role in healthcare via a structured questionnaire.

METHODS

Study Setting and Design

A descriptive cross-sectional survey was conducted from June 10, 2024, to March 10, 2025, at the College of Medicine, Northern Border University.

Sample Size and Sampling

Simple random sampling was performed using a random number generator in Microsoft Excel to select participants from the list of enrolled medical students.

Using a 95% confidence level, the minimum sample size was estimated at 386 based on a 50% expected proportion and 5% margin of error. Ultimately, 425 students were randomly selected and participated in the study.

Inclusion and exclusion Criteria

Students currently enrolled in the medical college were included while as those in the preparatory year excluded.

Research Tool

A structured questionnaire was used to assess perceptions of AI's role in healthcare. The questionnaire was piloted on 30 students to ensure clarity and reliability. The internal consistency was acceptable, with a Cronbach's alpha of 0.81. After obtaining free informed consent and collecting demographic details, participants answered 10 questions about the role of AI in healthcare. This was followed by five questions on the applicability of AI in healthcare. The final section of the questionnaire comprised five questions exploring students' views on integrating AI into healthcare.

Statistical Analysis

STATA/SE version 11.2 for Windows (STATA Corporation, College Station, Texas) was used for data management and analysis. The data were described in terms of frequency and percentage regarding categorical data and mean ± Standard Deviation (SD) regarding quantitative data. Shapiro-Wilk W test was used to examine the distribution of numerical scores. The Mann-Whitney test (Z) and the Kruskal Wallis test (X2) were used to compare students' perception towards AI application in healthcare between the different study groups, as appropriate. Statistical significance was considered at $p<0.05$.

Ethical Consideration

Prior to data collection ethical approval (No. 66/23/H) was obtained from the Local Committee of Bioethics at Northern Border University.

RESULTS

A total of 425 medical students from Northern Border University participated in the study. Most of the respondents were between 18 and 22 years old (71.06%) and female (58.82%). The majority were in their fourth year of study (48.94%), followed by students in the sixth (27.53%) and fifth years (11.29%) (Table 1).

When asked about their perceptions of AI in healthcare, a large proportion of students (80.71%) believed that AI could facilitate easier access to medical information. Additionally, 56.24% agreed that AI could enhance decision-making in clinical practice, and 59.06% believed it could help reduce human errors in diagnosis and treatment. Despite these favourable views, nearly half of the students (48.71%) expressed concern that AI might reduce the level of empathy in patient care. Furthermore, 55.29% felt that AI might negatively affect the trust between patients and doctors, and 52.94% were concerned about the potential threat AI poses to patient confidentiality. Overall, the mean perception score was 5.78 with a standard deviation of 2.95, on a scale of 0 to 10 (Table 2). A mean score of 5.78 (out of 10) reflects a moderately positive attitude toward AI, with room for further awareness and curriculum-based improvement.

Students also shared their views regarding AI integration into medical education and future practice. Approximately 62.82% supported incorporating basic AI concepts into the medical curriculum, while 61.88% emphasized the importance of training to minimize AI-related ethical risks. A notable majority (69.88%) agreed that AI could play a valuable role in medical research. However, 53.41% of respondents were concerned that AI might reduce employment opportunities for healthcare professionals in the future (Table 3).

Non-parametric tests (Mann-Whitney and Kruskal-Wallis) were chosen due to non-normal distribution of

Table 1: Age, Gender, and Academic Year of the Students Studied (N. = 425)

Variable		n.	Percentage
Age (years)	18-22	302	71.06
	23-27	121	28.47
	28 or above	2	0.47
Gender	Male	175	41.18
	Female	250	58.82
Academic Year	First Year	30	7.06
	Second Year	2	0.47
	Third Year	16	3.76
	Fourth Year	208	48.94
	Fifth Year	48	11.29
	Sixth Year	117	27.53
	Internship	4	0.94

Table 2: Students' Perception about the Role of Ai in Healthcare (n. = 425)

Question	Yes		No		I don't know	
	n.	%	n.	%	n.	%
Do you believe Artificial Intelligence (AI) enhances doctors' access to healthcare information?	343	80.71	24	5.65	58	13.65
Does AI contribute to more accurate decision-making by healthcare professionals?	239	56.24	92	21.65	94	22.12
Do you think AI reduces errors in clinical practice?	251	59.06	62	14.59	112	26.35
Does AI improve patient access to healthcare services?	289	68.00	58	13.65	78	18.35
In your opinion, does AI increase patient confidence in healthcare delivery?	207	48.71	100	23.53	118	27.76
Does AI assist patients in selecting the appropriate medical care?	243	57.18	64	15.06	118	27.76
Do you think AI negatively impacts the relationship between patients and healthcare professionals?	219	51.53	104	24.47	102	24.00
Does AI weaken the trust that is crucial to the patient-healthcare professional relationship?	235	55.29	88	20.71	102	24.00
In your view, does AI reduce empathy, sympathy, and the emotional bond between patients and doctors?	207	48.71	102	24.00	116	27.29
Do you believe AI affects confidentiality between patients and doctors?	225	52.94	98	23.06	102	24.00
Score Mean ±SD	5.78±2.95					

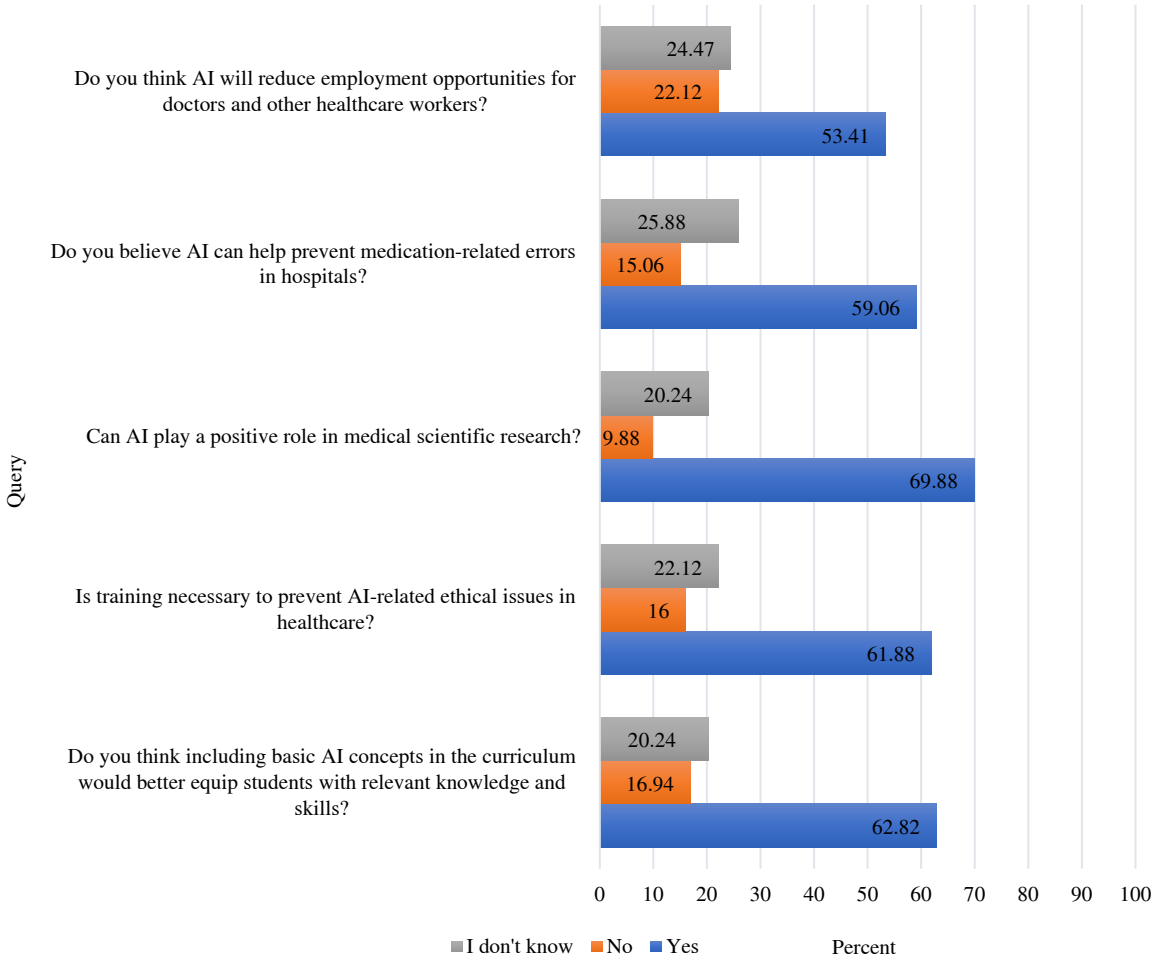

Figure 1: Students' Views on Integrating Artificial Intelligence into Healthcare (n = 425)

perception scores, as indicated by the Shapiro-Wilk test. Statistical analysis revealed no significant differences in perception scores based on age (p = 0.28), gender (p = 0.07), or academic year (p = 0.06), suggesting a generally consistent attitude toward AI among the student population (Table 4).

As depicted in Figure 1, the survey revealed that 62.82% of participants agreed that including basic AI concepts in the curriculum would better equip students with relevant knowledge and skills, while 61.88% endorsed the need for training to prevent AI-related ethical issues in healthcare. A majority (69.88%) believed that AI could play a positive role in medical scientific research, and 59.06% were certain that AI can help prevent medication-related errors in hospitals. Finally, 53.41% of participants thought that AI would reduce employment opportunities for doctors and other healthcare workers, whereas 22.12% disagreed and 24.47% were uncertain.

Furthermore, Figure 2 has been included to visually illustrate the relationship between demographic variables and perception scores.

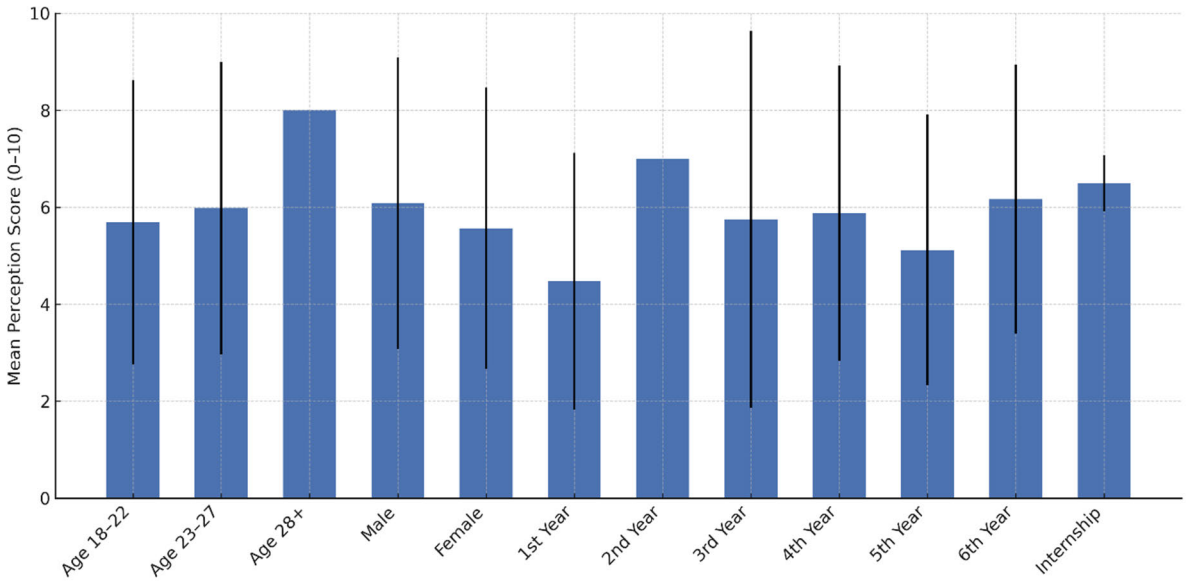

Figure 2: Mean perception scores regarding the role of AI in healthcare across demographic subgroups of medical students (N = 425). Bars represent the average score (on a 0–10 scale) with standard deviation

Table 3: Students' Opinions on the Application of AI in Healthcare (n. = 425)

Question	Yes		No		I don't know	
	n.	%	n.	%	n.	%
Do you think including basic AI concepts in the curriculum would better equip students with relevant knowledge and skills?	267	62.82	72	16.94	86	20.24
Is training necessary to prevent AI-related ethical issues in healthcare?	263	61.88	68	16.00	94	22.12
Can AI play a positive role in medical scientific research?	297	69.88	42	9.88	86	20.24
Do you believe AI can help prevent medication-related errors in hospitals?	251	59.06	64	15.06	110	25.88
Do you think AI will reduce employment opportunities for doctors and other healthcare workers?	227	53.41	94	22.12	104	24.47

Table 4: Variations in Students' Perceptions of the Role of AI in Healthcare Based on Age and Gender (n = 425)

Variable		N	Perception level Mean ±SD %	Test	P
Age (years)	18-22	302	5.69±2.93	X^2=2.53	0.28
	23-27	121	5.98±3.02		
	28 or above	2	8±0		
Gender	Male	175	6.09±3.01	Z=1.82	0.07
	Female	250	5.57±2.90		
Academic year	First Year	30	4.47±2.65	X^2=11.85	0.06
	Second Year	2	7±0		
	Third Year	16	5.75±3.89		
	Fourth Year	208	5.88±3.04		
	Fifth Year	48	5.12±2.79		
	Sixth Year	117	6.17±2.77		
	Internship	4	6.5±0.58		

X^2: Chi-square test statistics, Z: Mann-Whitney test statistics. Statistical significance was considered at $p<0.05$

DISCUSSION

The findings of this study provide valuable insights into the perceptions of medical students at Northern Border University regarding the role of artificial intelligence (AI) in healthcare.

As this study was conducted at a single institution, findings may not reflect the perceptions of all Saudi medical students.

Overall, the students demonstrated a generally positive attitude toward AI, recognizing its potential benefits while also expressing thoughtful concerns about its implications. These results align with the growing global interest in integrating AI into medical education and healthcare delivery [6-9].

The majority of respondents believed that AI could improve access to healthcare information and support more accurate clinical decision-making. These perceptions reflect an awareness of AI's capabilities in data analysis, pattern recognition, and diagnostic assistance. Similar findings have been reported in studies conducted in other countries, where medical students acknowledged AI's usefulness in enhancing the

accuracy and efficiency of healthcare services. For instance, studies from the UK, Syria, and Kuwait have highlighted student optimism toward AI's diagnostic and research capabilities [10–13].

However, the students also expressed reservations about the potential drawbacks of AI. More than half were concerned that AI might compromise the human aspects of patient care, including empathy, emotional connection, and trust in the doctor-patient relationship. These concerns are echoed in international literature, which warns that the over-reliance on AI tools may reduce face-to-face interactions and diminish the holistic care that patients often expect from healthcare professionals [5,14]. Furthermore, over half of the respondents were worried about AI affecting patient confidentiality-a valid concern given the growing reliance on cloud-based and data-driven technologies.

Importantly, a large proportion of students supported the inclusion of AI-related content in the medical curriculum. This highlights a growing recognition of the need for formal education and training in AI to prepare future doctors for emerging technological trends in medicine. By equipping students with foundational knowledge in AI, medical schools can bridge the gap between current practice and future innovations. A study showed similar enthusiasm among students, with many advocating for the integration of AI-related topics into medical training programs [21].

Another noteworthy concern expressed by students was the potential of AI to impact employment opportunities in the healthcare sector. While AI may automate certain routine tasks, it is unlikely to replace the nuanced judgment and interpersonal skills of healthcare professionals. Rather than viewing AI as a threat, there is a growing consensus that it should be seen as a complementary tool that can augment clinical decision-making and reduce cognitive load, allowing healthcare workers to focus more on patient-centred care.

Interestingly, our study did not find significant differences in perception scores across age groups, genders, or academic years, suggesting a broad-based awareness and acceptance of AI among the student body. This consistency could be attributed to the increasing visibility of AI applications in everyday life and the medical field, possibly reinforced by exposure to digital tools during medical training, even if AI-specific content is not yet formally embedded in the curriculum. The absence of significant differences by age, gender, or academic year may also indicate that attitudes toward AI are shaped more by general societal exposure than academic level or demographic status.

While the results of this study are encouraging, they also underscore the importance of addressing students' ethical, emotional, and professional concerns regarding AI. This is in line with other studies conducted in Saudi Arabia [33-36]. Future efforts should focus on developing comprehensive educational modules that address not only the technical aspects of AI but also its ethical and humanistic dimensions.

Limitations

This study was conducted at a single institution, which may limit the generalizability of the findings to other medical schools. Additionally, the use of self-reported data introduces the possibility of response bias. Other limitations include the cross-sectional design, which does not capture changes over time, and the absence of an assessment of participants' prior knowledge or exposure to AI.

Strengths

First study of its kind in the Northern Border region. Robust sample size and validated analysis.

CONCLUSION

While Northern Border University medical students are receptive to the adoption of AI in healthcare, they express valid concerns about its potential drawbacks. This underscores the need for balanced, well-structured AI education in medical curricula that addresses ethical, practical, and humanistic dimensions.

Recommendations

Medical curricula should incorporate AI modules, such as elective courses, workshops, or simulated clinical decision-making scenarios, to enhance AI literacy. AI education must emphasize not only technological proficiency but also ethical considerations, including patient confidentiality, bias mitigation, and the preservation of empathy in clinical care. Future research should adopt longitudinal, multi-institutional designs and consider pre- and post-intervention analyses of AI education impact.

Ethical Approval

Approval number 66/23/H was issued by the Local Committee of Bioethics at Northern Border University.

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Authors Contributions

All authors contributed to the research conception and design, data interpretation, and manuscript writing, and they have approved the final manuscript.

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